CERTIFICATE OF MAILING BY "EXPRESS MAIL"
Express mail label number EL855044688US
Date of deposit August 2, 2001
I hereby certify that this paper or fee is being deposited with the United States Postal Service Express Mail Post Office To Addressee service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington D.C. 20231
Christine Wheeler
(Name of person mailing paper or fee)
(Signature of person mailing paper or fee)

APPLICATION

Of

HELEN J. HARRIS

And

ROBERT S. HARRIS

For

UNITED STATES LETTERS PATENT

On

PROCESS FOR ASSOCIATING AND DELIVERING DATA WITH VISUAL MEDIA

Docket No. THEATR-38847
Sheets of Drawings: Seven

Attorneys
KELLY BAUERSFELD LOWRY & KELLEY, LLP
6320 Canoga Avenue, Suite 1650
Woodland Hills, California 91367

PROCESS FOR ASSOCIATING AND DELIVERING DATA WITH VISUAL MEDIA

RELATED APPLICATION

This application claims priority from provisional application Serial No. 60/224,459 filed August 10, 2000.

BACKGROUND OF THE INVENTION

The present invention generally relates to distributing broadband content and data. More particularly, the present invention relates to a process for associating and delivering data with visual media, and has particular application to associating audio and description narration with visual media for the benefit of the severely visually impaired.

According to United States census data, thirty-one million people in the United States are unable to completely enjoy movies or television because of severe visual impairment. Although the visually impaired can listen to the dialog between the various actors, as well as sound effects and music, they are unable to ascertain aspects of the film which are not spoken such as the background setting, character dress, relational placement of the characters, and unspoken action. It is estimated that the average movie contains forty-five minutes of unspoken action. Thus, a visually impaired person is literally left in the dark as to what is happening during the movie during these forty-five minutes.

Recently, the Federal Communications Commission has mandated television and cable networks begin offering "audio description" which would describe the unspoken action and other necessary narrative elements. According to the mandate, the television and cable producers must do so through the secondary language (SAP) channels on televisions. However, the vast majority of television and cable stations are not currently equipped with SAP systems. This will require an enormous financial investment on the

television and cable producers part to obtain the appropriate SAP analog equipment. Furthermore, such SAP systems require appropriate engineering, constant maintenance by qualified video engineers, and enormous storage space as the equipment must be air conditioned. Such equipment will become obsolete in a few years when the television and cable industry completely converts to digital. The cable industry association estimates that small cable companies alone will have to spend over 20 million dollars, and the entire industry close to 1 billion dollars to comply with the FCC ruling.

Accordingly, there is a need for a process for associating audio description within visual media, such as television and cable programming, which does not require television and cable stations to acquire SAP systems and equipment. What is further needed is a process for associating encoded audio description within the visual media so that only those wishing to listen to the audio description can do so selectively. Such coded audio description should not interfere with the presentation of the visual media. The present invention fulfills these needs and provides other related advantages.

SUMMARY OF THE INVENTION

The present invention resides in a process for associating and delivering data with a video signal. The general steps of the process comprise first encoding a video source signal by inserting data in unused video bandwidth of the video source signal. The encoded video source signal is then transmitted to its destination, where it is decoded. The data is separated during the decoding process and either visually displayed or audibly delivered to an end user.

The encoding step includes the step of digitizing an analog data signal. Typically, the analog signal comprises an audio signal. In a particularly preferred form of the invention, the audio signal comprises an audio narrative description of visual media associated with the video source signal for the benefit of the visually impaired. The digitized data is then

09216956.080204

compressed and transcoded for insertion into predetermined unused video lines of the video source signal.

The decoding step includes the steps of decompressing the inserted data after it is separated from the video source signal. The decompressed data is then converted from a digital format into an analog signal. When the analog signal comprises an audio signal, this signal is delivered to audio speakers, such as a headset worn by a visually impaired person.

As the data is associated with the video signal so as not to interrupt the transmission and reception of the video signal, the unused bandwidth of the video signal can be advantageously used to convey additional information. This may include a narrative description of the visual media so that a visually impaired person can be informed of the background setting, character dress, relational placement of the characters, and unspoken action of the visual media. This narrative description could also comprise on-screen visual messages, such as television program guides, and the emergency broadcast system visual messages. Of course, the invention is not limited to these uses, but can have other applications in which data can be advantageously associated with a video signal in a transparent fashion.

Other features and advantages of the present invention will become apparent from the following more detailed description, taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawings illustrate the invention. In such drawings:

FIGURE 1 is a flowchart illustrating the steps of encoding a video source signal in accordance with the present invention;

FIGURE 2 is a flowchart illustrating the steps taken in decoding the video source to remove the inserted data for delivery in accordance with the present invention;

FIGURE 3 is a representation of a video screen, illustrating lines of visible video, and lines which are reserved or unused and not typically viewed;

FIGURE 4 is a schematic block diagram illustrating the process of encoding an original video master in accordance with the present invention;

FIGURE 5 is a schematic block diagram illustrating the process of decoding the video master and separating the video signal and inserted audio data in accordance with the present invention;

FIGURE 6 is a schematic block diagram illustrating the general process of encoding an original video master with an audio narrative description for the benefit of the visually impaired in accordance with the present invention; and

FIGURE 7 is a schematic block diagram illustrating the process of encoding the original video master of FIG. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As illustrated in the accompanied drawings for purposes of illustration, the present invention is concerned with a process for associating and delivering data with a video signal. With reference to FIG. 1, data content to be inserted into a video signal (10), which may comprise either an audio signal (12) or visual graphics (14) or a combination thereof is provided. This content is typically in an analog signal format originally. In order to be associated and delivered with the video signal, the content is digitized (16). The digitized content is then compressed (18) and the compressed signal transcoded (20). The compressed and transcoded data content signal is then mixed with the video source signal (22), which is sent to the output medium (24), such as a video tape, DVD, MPEG file, digital tape, etc. The foregoing steps illustrated in FIG. 1 are collectively referred to as the step of encoding the video source signal with the data content.

The encoded video source signal is then transmitted to the end user, such as by transmitting through an Internet connection, playing a video tape

in a VCR, a DVD in a DVD player, or by cable or television transmission or the like. Due to the formatting of the data content, it essentially becomes one with the video source signal so as to be effectively transparent to all existing broadcast systems, equipment, players, etc.

With reference now to FIG. 2, the mixed and encoded source signal (26) passes through a decoding circuitry where it is decoded (28). The inserted data content is then separated and extracted (30) where it is displayed on screen, such as over non-encoded video, if the data content comprises graphics (32) or is routed to audio speakers or headphones in the case of audio data content (34).

It has been found that broadband content signals, particularly video signals such as television signals, have unused bandwidth, lines or holes which can be advantageously used to transmit data. So long as the unused bandwidth can be determined and found, and the data content to be distributed formatted appropriately to be fit within the unused bandwidth, simultaneous transmission is possible. The invention can have applicability to Internet, videos and graphics, distribution of information across wireless networks, information conveyed to personal digital assistance and other hand-held electronic devices, etc. The present invention is particularly adapted to be used on video input to televisions, and television broadcasts.

With reference to FIG. 3, a representative diagram of a televison screen (100) is shown. According to the NTSC SMPTE specification, there are a total of 525 video lines available for use. However, only 480 of those lines (102) are actually used for visible video. The remaining lines (104) are either unused or reserved for such things as closed captioning, picture control, etc. These lines are typically not viewed on a television set due to the extension of the frame of the television box over these unused lines. Different formats, such as PAL used in Europe, similarly have unused or reserved video lines of unused bandwidth. The present invention utilizes these unused lines or bandwidth to its advantage in order to associate and deliver data content which might otherwise be incompatible, or unrelated to the video signal transmission. The invention does this in a manner which

renders the associated and inserted data invisible or transparent to existing broadcast systems and equipment so that an end user desiring to extract the inserted data content need only have a decoder. Those not having a decoder would not be aware that additional information is contained within the unused bandwidth.

With reference now to FIG. 4, a schematic diagram of a recorder for a television application is illustrated. An original master video tape, CD, or DVD, or like is played in a system (106) where the video and audio signals (108) are separated. The audio or data content in analog signal is converted to digital (110) by appropriate circuitry. This digital signal is compressed (112) and then synchronized (114) with the video signal. This mixed and synchronized video signal having the data content inserted therein is re-recorded at track recorder (116) to overlay the original audio signal. This is recorded (118) on a new master (120) video tape, CD, or DVD.

Referring now to FIG. 5, the new master (120) is transmitted via cable, television broadcast, or played in the appropriate player, such as a VCR tape player, DVD player, or the like. A decoder, in the form of a set-top box, or electronic circuitry built into the television or player system includes a signal separator circuit (122) that extracts the inserted data content from the movie signal which is sent to the display device such as a T.V. (124). The extracted data content is then decompressed (126) using appropriate circuitry, after which it is converted back into its original analog signal format (128). At this point, the analog signal can be sent to an amplifier (130) for transmission to an audio speaker (132) or headset directly connected to the amplifier via a-jack or the like. Alternatively, the analog signal can be transmitted to a radio frequency transmitter (134) or transmission to an antenna (136) for wireless speakers, or a wireless headset. The systems shown in FIGS. 4 and 5 assume that the inserted data content comprises an audio signal. However, it is to be understood that the invention is not limited to such, and can include graphics which are overlayed on the television or monitor or the visual medium of the video source signal. Such graphics could also be separated and sent to a separate monitor or television set.

The process of the present invention allows "audio description narration" of a visual media to be encoded permanently onto the show picture master, thereby locking forever, regardless of whether the picture is copied, edited, or rebroadcast. Such audio descriptions are prepared prior to creation of the show picture master. Such audio descriptions will incorporate a narrative of unspoken action, or other necessary background information, which is seen but not heard in the visual media. Such visual media can include film, movies, television programming, and the like.

Referring to FIGS. 6 and 7, the original source master (142) includes both original video and audio signals (144) and (146). The video signal (144) is fed into and encoder (148) where it is processed, typically at a CCIR 601 level. Simultaneously, the audio signal (146) is fed into the encoder (148) in an unprocessed manner. A signal (150) from an audio description narration master (152) is also fed into the encoder (148). A closed captioning signal (154) may also be fed into the encoder (148) so that a new video signal (156) including the original video source signal (144), the inserted data from the description narration audio signal (150), as well as the closed captioning signal (154) is produced and saved on a new picture master (158). The original audio signal (146) is overlaid, and if necessary, re-synchronized, with the mixed and encoded video signal (156).

The encoder (148) is designed to accept both video and audio inputs for processing. The encoder (148) can function both as a dedicated hardware device or software application within editing system modified for non-linear video editing, such as AVID, Adobe Premier, After Effects, Final Cut Professional, and the like. The video source inputs can include composite, component, serial digital, DVD, MPEG, and all streaming formats. The audio source inputs can include composite, digital, analog XLR balanced and unbalanced SPDIF (Sony Phillips Digital) and streaming.

The encoding process takes a narrative audio sample of approximately 8KHZ in band width and converts that analog signal into a digital data stream. The data is further encoded and recorded to fit onto a single unused line of NTSC or PAL video.

Referring now to FIG. 7, a more detailed schematic illustration of the encoder (148) is shown. As stated above, the audio signal from the source tape (146) is fed into the encoder (148) where it typically is simply passed through unprocessed so as to remain 1 volt peak to peak, or re-synchronized if necessary to the record deck (160) where it is overlaid with the mixed video signal (156).

The video signal (144) from the source tape is fed into the encoder (148) through a video interface (162), where it may be necessarily decoded, before being fed into a video record mixer (164). Simultaneously, the audio signal (150) from the narration master (152) is fed into the encoder (148) so that the audio analog signal is converted to a digital stream by A/D converter (166). A codec receives the digital audio signal and processes it to remove unnecessary data in order to compress and reduce the size of the digital file. Several companies have specific codecs for 8K audio such as Qualcomm, Motorola, Quicktime and MP3, and RealPlayer. The remaining compressed digital audio file is sent to a transcoder (170) which inserts edit in the video record mixer (164) on a single line of video. The transcoder translates the language of the incoming signal into the language of the target signal or medium. This involves synchronizing and conforming voltages, bandwidth, bit rate, etc. so that the processed signal (172) is compatible with the video signal (144) Depending upon whether the signal is to be produced in the United States or abroad, the single line of video is inserted as NTSC or PAL. The narrated audio file is compressed to fit in a 32 KB band width in order to fit within a single line of video reserved for picture control, closed captioning and the like. The digital transcoded narrative audio signal (172) is inserted into one of these reserved lines. Such reserved lines of video do not interfere with the appearance of the broadcasted visual media, but rather are hid, for example, within the boxed portion of a television set. Furthermore, these reserved lines of video are transparent to the broadcaster equipment.

The video record mixer (164) combines the video signal (144) with the transcoded signal of the narration (172) and sends this signal (156) to the record deck (160). The video signal (144) that came from the original master

(142) now has a single line of video digital audio recorded on a chosen line and is recorded along with unprocessed audio (146) from the original master for recording on a tape or digi-beta tape which becomes a new picture master (158). Closed captioning (154) can interface with the encoder (148) to allow the dual encoding of both the closed captioning and narrated audio into the video signal (144) at the video record mixer (164) so that the closed captioning (154) is included on the new picture master (158). The closed captioning (154) is digitally set for a different line than the narrated audio (150), but both can be combined at the same time.

By encoding the show masters of all broadcast programming, similar to closed captioning, the audio narration can pass transparently through all existing broadcast systems and equipment.

The end users, the visually impaired and blind, will hear the associated audio description by one of several different means. Existing televisions can incorporate a decoder box to play the audio through the speakers of the television set. Alternatively, this signal can be sent directly to a head set worn by the visually impaired end user. The use of a headset allows those having normal sight to view the broadcasted programming in normal fashion without the audio description. It is anticipated that newly produced television sets will contain a decoder chip set which will take the line of video and produce the audio description for play directly through the speakers of the television. Of course, the signal can alternatively be sent to a head set worn by the visually impaired end user.

The decoder is essentially the reverse of the encoder (148) and reads the digital signal previously encoded onto the unused line of video and reprocesses the digital stream using the original code. The decoder also converts the digital signal to an analog signal using a D to A converter. The signal is then routed through either the dedicated decoder box, existing television speakers, or external set of headphones for final listening through composite audio connector usually having a one volt peak to peak signal similar to the original audio signal.

The invention can have additional applications to include digital lines for foreign languages. The blind are also excluded form a critically valuable service: the on-screen typed messages of the emergency broadcast system, which does not include audio. The encoder/decoder device thus becomes the emergency broadcast system for the blind and visually impaired. Also, television program guides are now in a typed format on-screen for sighted people. Visually impaired are currently excluded from those types of program listings.

Use of the present invention is beneficial as only the production facilities which create the master tapes would need to purchase the encoder (148) for implementation of the invention. With the increase of viewers, the producing company can acquire additional advertising dollars. Additionally, visually impaired-only audio advertising can be included in the narration audio signal so that products which are directed to the blind and visually impaired can be advertised directly to those consumers. This provides another potential source of income for the producer. Only the visually impaired and blind end users need purchase the decoding device or television, VCR, or other NTSC players which incorporate a decoding chip system. Thus, the cost of incorporating audio description is not born by those of normal sight nor of rebroadcasters, but rather those who derive benefit from the inclusion of audio description.

Although several embodiments have been described in detail for purpose of illustration, various modifications may be made without departing from the scope and spirit of the invention. Accordingly, the invention is not to be limited, except as by the appended claims.

0962456-060201